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Understanding Internet Usage Among Broadband Households: A Study of Household Internet Use Survey Data

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Statistics Canada
Science, Innovation and Electronic Information Division
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Note of appreciation

Canada owes the success of its statistical system to a long standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

User information

Symbols

The following standard symbols are used in Statistics Canada publications:

.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p	preliminary
r	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published

The science and innovation information program

The purpose of this program is to develop useful indicators of science and technology activity in Canada based on a framework that ties them together into a coherent picture. To achieve the purpose, statistical indicators are being developed in five key entities:

- **Actors**: are persons and institutions engaged in S&T activities. Measures include distinguishing R&D performers, identifying universities that license their technologies, and determining the field of study of graduates.
- **Activities**: include the creation, transmission or use of S&T knowledge including research and development, innovation, and use of technologies.
- **Linkages**: are the means by which S&T knowledge is transferred among actors. Measures include the flow of graduates to industries, the licensing of a university's technology to a company, co-authorship of scientific papers, the source of ideas for innovation in industry.
- **Outcomes**: are the medium-term consequences of activities. An outcome of an innovation in a firm may be more highly skilled jobs. An outcome of a firm adopting a new technology may be a greater market share for that firm.
- **Impacts**: are the longer-term consequences of activities, linkages and outcomes. Wireless telephony is the result of many activities, linkages and outcomes. It has wide-ranging economic and social impacts such as increased connectedness.

The development of these indicators and their further elaboration is being done at Statistics Canada, in collaboration with other government departments and agencies, and a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and we are continuing with our efforts to understand the characteristics of innovative and non-innovative firms, especially in the service sector that dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries that lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say only *how much* the federal government spends and *where* it spends it. Our report **Federal Scientific Activities, 1998 (Cat. No. 88-204-X)** first published socio-economic objectives indicators to show *what* the S&T money is spent on. As well as offering a basis for a public debate on the priorities of government spending, all of this information has been used to provide a context for performance reports of individual departments and agencies.

As of April 1999, the Program has been established as a part of Statistics Canada's Science, Innovation and Electronic Information Division.

The final version of the framework that guides the future elaboration of indicators was published in December, 1998 **(Science and Technology Activities and Impacts: A Framework for a Statistical Information System**, Cat. No. 88-522-X). The framework has given rise to **A Five-Year Strategic Plan for the Development**

of an Information System for Science and Technology (Cat. No. 88-523-X). It is now possible to report on the Canadian system on science and technology and show the role of the federal government in that system.

Our working papers and research papers are available at no cost on the Statistics Canada Internet site at *http://www.statcan.ca/cgi-bin/downpub/research.cgi?subject=193*.

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Understanding Internet Usage Among Broadband Households: A Study of Household Internet Use Survey Data

by Catherine Middleton, Ryerson University and Jonathan Ellison, Statistics Canada

1 Introduction and background for the study

For more than a decade, the Government of Canada promoted strategies to enable Canadians to become participants in the information society (Government of Canada 1999, Government On-Line Advisory Panel 2003, Industry Canada 1994). As part of these strategies, it was recommended that broadband[1] Internet access be made available to all Canadian households (National Broadband Task Force 2001), but there are still many unserved and underserved areas in the country (CRACIN 2005). Although many provincial initiatives are making progress in extending broadband coverage (e.g. Alberta SuperNet 2005; CommunityNet 2006; Ministry of Agriculture Food and Rural Affairs 2007), and the Canadian Radio-television and Telecommunications Commission (CRTC) has ordered an expansion of broadband services in regional areas (CRTC 2008) broadband services are still not yet available to all Canadians.

It is widely believed that having access to a broadband Internet connection provides individuals with social and economic benefits, including access to employment and educational opportunities, e-commerce, facilitated communication with municipal, provincial and federal governments, and improved access to health care information (Anderson and Raban 2005, Firth and Mellor 2005, ITU 2003, Lai and Brewer 2006, Middleton 2007). Using U.S. data, analysis conducted by the MIT Communication Futures program concluded that broadband access "enhance[s] economic growth and performance, and that the assumed economic impacts of broadband are real and measurable" (Gillett, Lehr, Osorio and Sirbu 2006: 4). The adoption of broadband and other information and communications technologies is seen as "essential to increasing Canada's productivity and competitiveness" (Telecommunications Policy Review Panel 2006:8-4). This perspective is shared by the European Union, where the Commission of the European Communities (2006) has declared that broadband is "crucial for fostering growth and jobs" (i2010 2006:non-paginated).

1 The National Broadband Task Force defined broadband as "a high-capacity, two-way link between end user and access network suppliers capable of supporting full-motion interactive video applications. ... A minimum symmetrical speed of 1.5 megabits per second per individual user is currently required to support these applications." (National Broadband Task Force 2001:10) In practice, broadband access for Canadians is defined by what it is not: that is, broadband Internet is not dial-up. Various service providers offer different "flavours" of broadband access, ranging from what are billed as "ultra light" connections with bandwidth of 128 Kbps, up to "ultra" services, with bandwidth of 5 Mbps or higher. In urban areas, the majority of broadband connections are provided by digital subscriber line (DSL) or cable, and do not provide symmetrical connectivity. Veenhof, Neogi and van Tol (2003) offer insights into broadband connectivity in Canada.

Box 1:

Availability of broadband data

Data on broadband adoption are collected in different ways by different organizations. In Canada, for instance, Statistics Canada's Household Internet Use Survey (HIUS) measured broadband adoption in terms of the number of households who have a high speed Internet connection (2001-2003). The Canadian Internet Use Survey (CIUS) (2005) measured the number of individual Canadians accessing the Internet from home using a high speed connection. Additionally, Statistics Canada's Survey of Household Spending (SHS) tracks the presence of high speed connections in Canadian households on an annual basis. In order to compare adoption rates on a country-by-country basis, researchers generally rely upon the data aggregated by the Organisation for Economic Cooperation and Development (OECD) or the International Telecommunication Union (ITU) (e.g. ITU 2007; OECD 2007b). These organizations report broadband adoption rates in terms of broadband subscribers per 100 inhabitants of a country, and rankings are closely monitored as indicators of national competitiveness (Bleha 2005, Fransman 2006).

As is seen in Table 1, Canadians were among the early leaders in broadband adoption (Lie 2003). According to available figures, the country's adoption rate was second only to South Korea from 2001 through 2003. By 2004, Canada had slipped to third place in broadband adoption, behind Denmark and South Korea. As of June 2007, adoption rates in South Korea, the Netherlands, Switzerland and Scandinavian countries had overtaken those in Canada, dropping it to ninth overall.

Table 1
International broadband subscribers per 100 inhabitants and rankings, 2001 to 2007

	2001 [1]	2002	2003	2004	2005	2006	2007
	number						
Canada							
Subscribers	8.8	10.2	13.1	16.4	19.0	21.9	25.0
Rank	2	2	2	3	5	9	9
Denmark							
Subscribers	4.4	6.6	11.0	16.9	21.7	29.3	34.3
Rank	5	4	3	2	3	1	1
Iceland							
Subscribers	3.7	5.3	10.8	15.2	21.5	26.5	29.8
Rank	8	7	4	5	4	3	6
Korea							
Subscribers	17.2	20.3	22.9	24.2	25.5	26.4	29.9
Rank	1	1	1	1	1	4	4
Netherlands							
Subscribers	3.8	4.9	9.1	15.4	22.3	28.8	33.5
Rank	7	8	8	4	2	2	2
Norway							
Subscribers	1.9	3.0	6.2	11.3	18.1	24.4	29.8
Rank	13	14	12	10	8	7	5
Switzerland							
Subscribers	2.0	3.8	9.2	14.6	20.2	26.2	30.7
Rank	12	11	7	6	5	5	3
United States							
Subscribers	4.5	5.5	7.9	10.9	14.2	17.9	22.1
Rank	4	6	10	12	12	13	15

1 2001 data are for December, 2002 to 2007 data are June figures.
Source(s): Organisation for Economic Co-operation and Development (OECD), 2007a; 2007b, rounded to one decimal place.

Canadian adoption rates continue to outpace those in the United States, but there are concerns that Canada will lose its competitiveness in the global knowledge economy if it cannot maintain its position as a leader in broadband deployment (Telecommunications Policy Review Panel 2006). But despite the widespread usage of the OECD broadband adoption data for international comparisons, the penetration rates simply acknowledge that there is opportunity for broadband usage among adopters. Adoption rates do not reveal nuances of actual usage, so provide little insight on what people actually do with their broadband connections and do not necessarily signify that residents are prepared to participate in the information society.

Orbicom and the ITU have developed the ICT Opportunity Index to measure access to, and usage of, information and communications technologies (ICTs) (ITU 2007). This indicator captures opportunity for ICT usage by assessing infrastructure availability (e.g. land and cell phone lines, bandwidth per inhabitant), user skill levels, and adoption rates for computers, television, Internet, broadband Internet, as well as outgoing telephone traffic. The index scores allow for international comparisons of ICT capacity and uptake, offering a valuable starting point for understanding whether citizens have the opportunity to, and do, participate in the information society. But even taken collectively, the OECD broadband adoption data and the ICT Opportunity Index scores are not intended to offer detailed insights on the nature of citizens' participation in the information society.

DiMaggio and Hargittai (2001:1) argue that as access to technical infrastructures becomes more widespread and Internet penetration rates increase, the research focus should shift from the digital divide (whether people have access to the Internet) to 'digital inequality,' defined as "inequality among persons with formal access to the Internet". Similarly, Attewell (2001) describes access as the 'first digital divide,' suggesting that usage is a second, and more critical, digital divide that must be bridged in order to share in the benefits of an information society. Gurstein (2003:non-paginated) makes the case that access is not the end objective for the development of ICT infrastructures, policies and practices, arguing for coupling access with "the knowledge, skills, and supportive organizational and social structures to make effective use of that access and that e-technology to enable social and community objectives".

While the Internet is not the only means of engagement in a knowledge economy or information society, information and communications technologies make up the infrastructure that provides access to knowledge and information (Kahin and Foray 2006). There is an "implicit assumption that lack of access to information in a world where access to it is increasingly important can confer disadvantages, or compound them where already present" (SIBIS 2003:40). Without access to infrastructure, and without the skills and literacy to make use of knowledge and information, citizens may be disadvantaged. Conversely, it is assumed that with access to the Internet, and especially with broadband Internet access, citizens are well-positioned to participate in the information society and accrue the related benefits. But access alone does not guarantee effective use.

Working in the European context, Anderson and colleagues (Anderson and Raban 2005, Anderson, Gale, Jones and McWilliam 2001) considered the impacts of broadband adoption by studying post-adoption behaviours. In their 2005 work, they concluded that the differences in user behaviours between people using broadband and narrowband (low speed or "dial-up") Internet connections are attributable more to experience levels than to the technology itself. Broadband in and of itself does not create specific benefits, rather its users must be experienced enough to understand and take advantage of the potential benefits broadband can bring. Further, they noted that even among broadband users, the most widely used services were for communication purposes (a finding consistent with Middleton (2003)), and that switching to broadband did not increase the amount of money spent online. They cautioned that their study was based on 2002 data, but based on these data expressed concerns that a focus on technology (i.e. getting people to use broadband networks) was not sufficient to result in usage patterns that reap the potential benefits of broadband.

Reporting on broadband usage in the U.S., Kolko (2006) showed that broadband adoption was associated with an increase in the frequency of use of some online activities (including music downloads and purchasing), yet had no significant impact on other activities (e.g. job searching, and accessing government information and services). Among experienced broadband users, Kolko reported increases in some activities over time, and decreases in others, indicating that the overall impact of broadband usage on online behaviours was unclear.

In an early study of broadband uses in the U.S., Horrigan and Rainie (2002) concluded that users with broadband connections were more sophisticated in their usage of the Internet than those with lower speed connections. Anderson and Raban's (2005) work suggested that it is not the broadband connection per se that drives this finding, rather it was the fact that in general, broadband users were more experienced Internet users and thus their usage patterns reflected greater experience and comfort levels with the Internet. In their study of the economic benefits of broadband, Gillett et al. (2006:3) made the point that in order to achieve these beneficial outcomes "broadband had to be used, not just available".

The purpose of this study is to gain a better understanding of how broadband is used by Canadian households. This study uses Household Internet Use Survey data to present a picture of actual broadband usage in the three year period (2001-2003) during which Canada was second in the OECD broadband rankings, and to consider whether existing uses of broadband networks support claims that broadband access prepares users for participation in the information society. In particular, the study illustrates differences in scope of usage between high speed and low speed households, and between high intensity and low intensity households.

Box 2:

Primary data source for this study

This study analyzes data from Statistics Canada's 2001, 2002 and 2003 Household Internet Use Survey (HIUS). This survey was not conducted in 2004 and was redesigned, replaced by the Canadian Internet Use Survey (CIUS) in 2005, which collects individual-level data on Canadians' Internet usage. The study reports on the 2001 through 2003 data sets.[2] The analysis is conducted on households in which, for a typical month, at least one individual used the Internet from home. This paper provides a foundation for further analysis of scope and intensity of Internet usage by individual Canadians based on the CIUS data.

For this study, responses from the 2001-2003 HIUS concerning connection speed, cost of connection and pricing plan were used to categorize household Internet connections as high speed or low speed. In cases where there was insufficient information in response to these questions, or information appeared inconsistent, the household could not be categorized on the basis of speed and was dropped from the analysis.

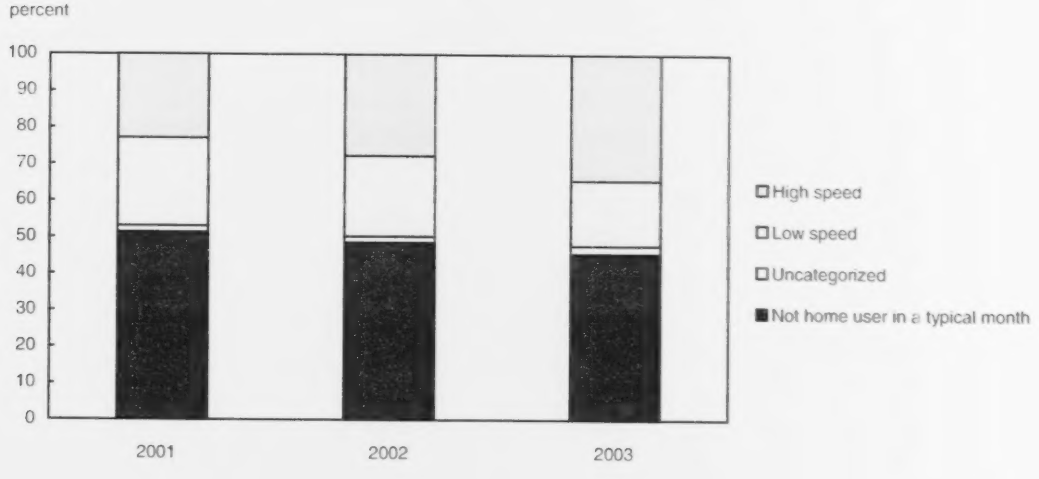
The CIUS (2005) variable for speed of Internet connection was derived from a set of questions asking respondents about their type of home Internet connection. Respondents who indicated that they had a cable or satellite connection were classified as having high speed connections, while those with other types of connections (e.g. telephone, television, wireless or other) were asked a follow-up question: "Do you access the Internet at home using a high speed connection?"

2 Understanding usage patterns in Canadian broadband households

In the context of this study, there are several variables of interest. The starting point for the analysis is Canadian households in which at least one individual used the Internet *at home* in a typical month. In 2001, 48.7% of households (5.8 million) were in this category. In 2002 the number increased to 51.4% (6.3 million), rising to 54.5% (6.7 million) in 2003. The 2005 CIUS (Statistics Canada 2006) reported that an estimated 61% of Canadian households (7.9 million) had Internet connections, indicating that growth in Internet adoption continued, but at a slower rate than observed earlier in the decade (Middleton & Sorensen 2005). Within the subset of households using the Internet from home in a typical month, the focus in this study is on households with broadband (high speed) Internet connections, shown in Chart 1 below.

2 This study uses three separate representative samples of households from the ten Canadian provinces, covering each year from 2001 to 2003. While the use of these samples allows for inferences to be made about changes in Internet usage behaviour at the national level over time, different households are sampled each year.

Chart 1
Canadian household Internet usage, showing speed of Internet connection for households using the Internet from home in a typical month



Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

In order to better understand the nature of Internet usage among Canadian households, and to explore the differences between high speed and low speed households, variables measuring intensity and scope of Internet use were derived from the HIUS datasets. *Intensity* of use is assessed based on responses to questions about frequency of Internet usage, and time spent online. Households were classified as high intensity or low intensity based on their Internet usage (see Box 3 for more details about the intensity variables used in this study). *Scope* of use was based on responses to questions about the sorts of online activities household members did in a typical month. Several variables were created to measure scope (see Box 4 for a description of the scope variables and how they were constructed). Analysis of scope and intensity of use among high speed and low speed Internet users was carried out to explore the nuances of Canadian household Internet adoption patterns. In particular, these variables go beyond basic adoption data to show the extent to which the Internet is used (intensity) and the breadth of Internet usage (scope). These variables can be taken as proxies for engagement with the Internet, with those who exhibit higher intensity and broader scope of usage expected to be better prepared to participate in the information society.

Box 3:

Intensity variables used in this study

For purposes of this study, high intensity households are those reporting that members of the household used the Internet at home "at least 7 times per week", and spent more than 39 hours online per month. Households who used the Internet less frequently and/or spent 39 or fewer hours online per month were labelled as low intensity households.

A direct comparison of household and individual intensity of use is difficult, primarily since response units (household vs. individual) differ, but also since the HIUS and CIUS used different measures of time spent online. To provide general context for the trends in Internet usage over time, intensity measures are also provided for the CIUS data. In the CIUS, high intensity users are defined as those who go online from home at least once a day and spend 5 or more hours online at home in a typical week. By contrast, low intensity users are defined as those who do not go online every day, and/or spend less than 5 hours online in a typical week.

When interpreting intensity measures, readers are reminded of an important consideration concerning the use of time online as part of the intensity variable: broadband connections generally allow users to perform activities online more efficiently than low speed (dial-up) connections. While not always the case, a high speed Internet user typically achieves more (in terms of a specific online activity or a variety of activities) than a low speed user over the same amount of time. This point should be borne in mind when interpreting comparisons between high speed and low speed Internet users.

Table 2 categorizes Internet-use households based on the speed of their connection and on the intensity of Internet usage. Over time more and more households are migrating to high speed connections. By 2003, it was estimated that almost two-thirds of the Canadian households that used the Internet from home in a typical month had a high speed connection. Although the proportion of low intensity households declined annually, low intensity households continued to outnumber high intensity households. Individual level data collected in 2005 are not directly comparable, but similar measures of intensity for individual Canadians show that low intensity patterns of Internet usage continued to be more prevalent than high intensity usage patterns, despite a very clear shift toward high speed connectivity.

Table 2
Internet households and individuals, by speed and intensity

	Households			Individuals
	2001	2002	2003	2005 [1]
	percent			
High speed	48.8	55.6	65.7	81.4
Low speed	51.2	44.4	34.3	18.6
High intensity	35.4	38.2	40.1	42.7
Low intensity	64.6	61.8	59.9	57.3

1. Canadian Internet Use Survey (CIUS) data cover individuals instead of households and are not strictly comparable with Household Internet Use Survey (HIUS) data from previous years, but are provided here to show overall trends. See Box 2 for further information on data sources.

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003 and Canadian Internet Use Survey, 2005.

The relationship between intensity of use and the speed of households' Internet connections is shown in the matrix below (Table 3). Of particular interest is the proportion of households categorized as high speed but low intensity (HSLI). While the trend among high speed households shows an increase in high intensity usage, more than half the high speed households in 2003 were low intensity Internet users, meaning household members were online fewer than seven times per week, or for less than 40 hours per month. This observation provides initial evidence that there are different kinds of broadband households, as it shows that access to a high speed connection does not necessarily result in high intensity usage.

Table 3
Speed-intensity matrix, showing percentage of households in each quadrant

	2001	2002	2003
	percent		
High speed			
High intensity	22.9	27.5	32.0
Low intensity	25.9	28.2	33.7
Low speed			
High intensity	12.5	10.8	8.1
Low intensity	38.7	33.6	26.2

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

Scope of usage measures the types of activities conducted online by household members, and provides a way of investigating differences in usage on the basis of speed and intensity dimensions. The first measure of scope provides a count of online activities reported by a household in a typical month. This measures the breadth of Internet usage. The average number of different activities reported in a typical month ranged from 8.6 in 2001 to 8.9 in 2003 (Table 4). But examining scope of usage in the context of speed and intensity shows a somewhat different picture.

Box 4:

Variables measuring scope of Internet use

Measures of breadth of Internet use were based on counts of the number of activities that respondents reported at least one member of their household performed in a typical month. The maximum number of activities recorded on the HIUS was 17, while the minimum was 0. Activities were also aggregated around common themes for further analysis of scope of use, producing measures of usage of the Internet for banking, communication, purchasing, education and job searching, leisure and other information searching activities. The grouping of activities used for these purposes was as follows:

Online purchase: In a typical month does any member of your household use the Internet at home

... to purchase goods and services?

Education/Job Search: In a typical month does any member of your household use the Internet at home

... for formal education, training or school work?
... to search for employment?

Information Search: In a typical month does any member of your household use the Internet at home

... to search for medical or health related information?
... to search for government related information?
... for general browsing?
... to view the news?
... for travel information/arrangements?
... to search for other information?

Entertainment/Leisure: In a typical month does any member of your household use the Internet at home

... to play games on the Internet?
... to obtain and save music?
... to listen to the radio?
... to find sports related information?

Communication: In a typical month does any member of your household use the Internet at home

... for E-mail/Hotmail?
... to participate in chat groups?

Table 4
Mean number of online activities in a typical month, by household speed and intensity

	2001	2002	2003
	percent		
High speed			
High intensity	10.5	10.6	10.6
Low intensity	8.6	8.8	8.6
Low speed			
High intensity	9.4	9.5	9.2
Low intensity	7.2	7.1	7.0

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

High speed high intensity (HSHI) households averaged more than 10 activities per month, compared to the low speed low intensity (LSLI) household average of 7 monthly activities.[3] Low speed high intensity (LSHI) households carried out a wider variety of online activities than high speed low intensity (HSLI) households. Consistent with previous analysis of these data sets (e.g. Middleton and Sorensen 2005), it is also noted that there are differences in usage patterns based on household income, education levels of the head of household, and age of the head of household. Veenhof, Clermont and Sciadas (2005) report similar findings based on the Adult Literacy and Life Skills Survey data. Higher income households have higher mean numbers of online activities, as do those headed by persons with higher education levels. Households headed by older people have lower mean numbers of online activities.[4] This study focused on understanding basic differences in scope and intensity. It is noted that with its individual level data, the CIUS data set is better suited for further analysis that focuses on how differences in scope and intensity of usage are influenced by specific demographic characteristics.

While it is interesting to consider total numbers of monthly activities as a method for understanding differences in household Internet usage patterns, additional insights can be gained when the online activities are categorized. As was noted earlier, broadband Internet access is touted as a means for individuals to conduct business transactions, participate in educational activities, access health care and government information, communicate with others, and foster a stronger sense of community. HIUS data allow for an assessment of broadband users' financial and purchasing activities, their use of the Internet for communication, leisure and education, and the extent of their online searching activities. Extensive analysis was conducted to investigate different usage patterns based on the speed and intensity of household Internet connections. A selection of these results is presented below, illustrating interesting differences among households.

In looking at the data on scope of household Internet usage, it is noted that in most cases, the trends are predictable. For instance, over time the average number of households that have made an online purchase in a typical month is increasing (see Table 5).

Table 5
Households who made an online purchase in a typical month, by speed and intensity

	2001	2002	2003
	percent		
High speed			
High intensity	37.4	42.3	45.8
Low intensity	24.9	30.1	32.6
Low speed			
High intensity	31.8	32.9	37.6
Low intensity	19.7	22.2	23.7
All types	**26.6**	**31.1**	**34.9**

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

What is of note in these data is the fact that even by 2003, 65% of Canadian households using the Internet did *not* make an online purchase in a typical month, and more than 75% of those in the low speed low intensity category did not purchase anything online. Even amongst those in the HSHI category, less than half indicated that they had made an online purchase in a typical month. Other research using 2005 CIUS data also emphasizes that most online purchasing activities continue to be concentrated among a relatively small proportion of users (McKeown and Underhill 2007).

An examination of Internet usage for educational or job search related purposes (Table 6) showed large differences among households who did *not* use the Internet in a typical month for either purpose (e.g. in 2003, more than 42% of high speed low intensity households did not engage in educational or job seeking Internet activities, as compared

3. For each year, an analysis of variance is significant ($p<0.05$), indicating the means for each category are not equal.
4. It is noted that certain online activities, especially those in the education/job search category, may be less relevant in households headed by older persons, due to their position in the life cycle (particularly those who are retired).

to just 26% of the high speed high intensity households). It is also noted that the percentages of households not using the Internet for educational or work purposes is not decreasing over time as might be expected.[5]

Table 6
Households who did not use the Internet for job seeking or education in a typical month, by speed and intensity

	2001	2002	2003
	percent		
High speed			
High intensity	24.4	25.1	26.0
Low intensity	42.5	39.5	42.4
Low speed			
High intensity	29.8	27.7	32.3
Low intensity	47.3	48.5	50.1
All types	**38.6**	**37.3**	**38.4**

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

An analysis of households' online searching behaviours provides a good measure of the breadth of online activities conducted in a typical month. A count of six different types of information searching indicated that the majority of households do use the Internet for a variety of search purposes (see again Box 4 for a list of the types of searches measured). In 2001, 55.8% of households searched for four or more types of information in a typical month (Table 7). These numbers rose to 59.2% in 2002, and 61.4% in 2003. High intensity households were more likely to engage in more search behaviours than low intensity households.

Table 7
Households who searched for four or more types of information in a typical month, by speed and intensity

	2001	2002	2003
	percent		
High speed			
High intensity	67.8	70.4	74.0
Low intensity	54.9	59.0	59.8
Low speed			
High intensity	62.3	64.9	63.8
Low intensity	47.2	48.3	47.4
All types	**55.8**	**59.2**	**61.4**

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

The Internet can also be used for entertainment and leisure purposes. The HIUS captured data on Internet use for downloading music, listening to the radio, playing games and seeking sports information. Table 8 provides data on households who have used the Internet for at least one entertainment or leisure activity in a typical month. It is not surprising that high speed households are more likely to engage in leisure activities online, as activities like downloading music, listening to the radio and playing games are much more enjoyable with a high speed connection. Despite the disadvantage of a low speed connection, almost 80% of LSHI households engaged in at least one entertainment or leisure activity online, but in 2003 this was the one type of activity where high speed low intensity (HSLI) usage is greater (although just slightly) than low speed high intensity (LSHI). It is interesting to note that, using this measure, the incidence of use of the Internet for leisure and entertainment activities declined slightly over time. However, it is acknowledged that the survey instrument may not have captured the full gamut of online entertainment and leisure activities that emerged over the time period studied.

5. Further work using CIUS data could assess the importance of labour force status, age of household members, and the presence of students in the household to gain a better understanding of these data.

Table 8
Households who used the Internet for at least one leisure or entertainment activity in a typical month, by speed and intensity

	2001	2002	2003
	percent		
High speed			
High intensity	93.9	92.5	90.9
Low intensity	83.9	84.1	81.2
Low speed			
High intensity	86.3	84.2	79.8
Low intensity	67.7	63.8	59.3
All types	**80.2**	**79.6**	**78.5**

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

Data are available on household usage of email and chat groups, and were aggregated as a communication variable. In the three year period there were very few changes in overall usage patterns (Table 9). As of 2003, 70.8% of households used one communication tool in a typical month (although these data do not show which tool, it is reasonable to expect that the majority of those households just using one communication tool would be using email, as seen in Table 10), compared to just 3.0% who did not use the Internet for communication purposes (down slightly from 3.8% in 2001). Stating this another way, 97.0% of online households did use the Internet for communication purposes.

Table 9
Online households who used the Internet for communication purposes in a typical month, by number of uses

	2001	2002	2003
	percent		
Number of uses			
None	3.8	3.3	3.0
One	68.7	70.0	70.8
Two	27.4	26.7	26.2

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

Email is the most widely adopted online activity. Differences among speed-intensity types are minimal, with even LSLI households nearing full adoption of email as shown in Table 10.

Table 10
Households who used email in a typical month, by speed and intensity

	2001	2002	2003
	percent		
High speed			
High intensity	98.4	98.6	98.6
Low intensity	95.0	95.6	96.0
Low speed			
High intensity	96.9	98.0	97.6
Low intensity	93.5	93.4	94.3
All types	**95.4**	**95.9**	**96.5**

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003.

3 Discussion

Table 11 provides a summary of the 2003 scope data, showing marked differences in household Internet usage activities when assessed based on intensity. For each aggregate measure of activities it is demonstrated that high intensity users are also higher scope users.[6] In other words, the high intensity users were observed to have a greater breadth of usage of the Internet and, in a typical month, did a wider range of things online than low intensity users. This finding makes sense, as those households that did more online are also those households that used the Internet more frequently. These findings suggest that those who found the Internet more useful (as measured by the scope of their online activities) also used it more intensely.

Table 11
Summary of online activities by speed, and intensity, Internet use households, 2003

	High speed		Low speed		All types
	High intensity	Low intensity	High intensity	Low intensity	
	percent				
Type of behaviour					
Purchasing	45.8	32.6	37.6	23.7	34.9
Education/job search [1]	26.0	42.4	32.3	50.1	38.4
Search [2]	74.0	59.8	63.8	47.4	61.4
Leisure [3]	90.9	81.2	79.8	59.3	78.5
Communication [3]	98.6	96.0	97.6	94.3	96.5

1. Did not use in a typical month.
2. 4 or more activities.
3. At least one activity.

Source(s): Statistics Canada, Household Internet Use Survey, 2003.

What is interesting in these findings is that the *speed* of the household Internet connection is not so clearly connected to the scope of usage activities.[7] Although it has been suggested that high speed users are also more sophisticated users of the Internet, this is not observed in this analysis, when scope of Internet usage is taken as a measure of sophistication of use. In the activities examined above, high intensity users with low speed connections (LSHI) demonstrated broader scope in their Internet activities than low intensity users with high speed connections (HSLI).[8]

6. The exception is the 2003 leisure/entertainment data, where the differences between HSLI and LSHI households are small.
7. It is noted that this analysis does not examine causality among variables.
8. Again, the exception is the 2003 leisure/entertainment data, where the differences between HSLI and LSHI households are small.

A ranking of scope of usage shows HSHI first, followed by LSHI, HSLI and LSLI, showing the dominance of intensity over speed.

The findings above reveal that speed of connection alone is insufficient in explaining sophistication of use. As revealed earlier in this study (see again Table 3), in each year from 2001 to 2003, there were more low intensity households among broadband users than there were high intensity households. While the numbers were quite close in 2003 (33.7% low intensity, 32.0% high intensity), what is important to recognize is that approximately half of the Canadian households that did have a broadband connection were relatively light users of the Internet. This is at a time when Canada was second in the world in broadband adoption. The low intensity households were shown to be less engaged in Internet activities (as measured by scope), demonstrating that broadband access alone did not result in extensive broadband usage. It is possible that some low intensity high speed users were attracted to broadband Internet for its convenience (always-on connectivity, phone line not in use when online), rather than for its speed, suggesting that intensity of use may be a better measure of engagement with the Internet than the speed of Internet access.

This research also presents valuable findings in terms of understanding the relative popularity of various online activities within Canadian households. Table 12 provides summary data on average scope of use, demonstrating that despite the high rates of broadband adoption by Canadian households, their overall scope of use was quite low in some areas. In 2003, about two-thirds of online Canadian households did not make an online purchase[9] and nearly 40% of households did not use the Internet to look for work or for educational purposes in a typical month. If the Internet is to become a means of engaging Canadians in the knowledge economy, through online commerce and lifelong educational activities, and as a means of helping Canadians gain employment, there is a long way to go before this objective can be achieved on a universal basis.

Canadian households were using the Internet quite extensively to search for information (including information on government services, health care and travel), but there was a large percentage of the online user community that engaged in relatively limited searching activity. As searching is an essential means of navigating the Internet, extensive searching capability is needed to be a proficient Internet user. It is true that not all users will need to search for a wide variety of different information types, but wider searching patterns do indicate more willingness to engage with the Internet as a resource to support daily activities. The use of the Internet for entertainment and leisure may also indicate an increased level of engagement with the Internet. But usage in this category declined slightly from 2001 to 2003. It is unclear whether this represents a real decline in use of the Internet for entertainment purposes, or whether it is more a reflection that the survey instrument did not ask respondents about additional online leisure activities that emerged over time. Canadian households have embraced the Internet as a communication device. The vast majority of households reported using email and/or chat, thus indicating a basic skill level in Internet use.

9 This analysis did not consider HIUS data on "window shopping," that is, use of the Internet to browse for goods or services without actually ordering or paying online.

Table 12
Summary of scope of household Internet activities, percentage of Internet use households

	2001	2002	2003
	percent		
Type of behaviour			
Purchasing	26.6	31.1	34.9
Education/job search [1]	38.6	37.3	38.4
Search [2]	55.8	59.2	61.4
Leisure [3]	80.2	79.6	78.5
Communication [3]	96.2	96.7	97.0

1. Did not use in a typical month
2. 4 or more activities
3. At least one activity

Source(s): Statistics Canada, Household Internet Use Survey, 2001 to 2003

HIUS data do not allow for analysis of Canadian households' motivations for using the Internet, thus it is not possible to assess the extent to which households are disinterested in certain activities. Nevertheless, it is argued that the scope of Internet usage can be used as a means for assessing overall engagement levels with the Internet, no matter the reasons underlying such engagement. Regardless of whether Canadian households are not partaking in certain online activities because they are not interested in them, or because they do not have the necessary skills, computer literacy or equipment to do so, the fact remains that these data show that Canadian households have not equally or fully embraced the range of online activities available to them.

4 Conclusions

This study demonstrates that broadband connectivity does not in and of itself lead to enhanced engagement with the Internet. For people to become full participants in an information society, they must become engaged with the Internet. Governments around the world are taking actions intended to result in the Internet (and other information and communications technologies) becoming a fundamental part of society (ITU 2006), and the primary means by which to engage with various societal members. Information and communications technologies are expected to be more widely used to support health care, to provide educational opportunities, to connect and foster communities, to support cultural activities, and to facilitate commerce and trade. Citizens without access to such technologies may be disadvantaged.

The contribution of this study is to show that there are differences among Canadian broadband users, challenging the widely held notion that broadband adoption in and of itself somehow means that users are ready and willing to become full participants in the information society. There are broadband users who do fit this assumption, but there are also many broadband households that demonstrate much less engagement with the Internet, and are expected to have less interest, and possibly less aptitude, to fully embrace and participate in an ICT-enabled society.

There is a gap between the provision of broadband and the usage of broadband. As Anderson and Raban (2005:15) note, "broadband access will not change the structural problems already found in narrowband – those who have the knowledge and experience gain the most benefit whilst those who lack the skills, knowledge and perhaps self-confidence are left further behind".

While increases in broadband adoption rates may be viewed as measures of "e-readiness" or "e-intensity," the findings presented here do not support these claims. In Canada, there is a large group of low intensity broadband households, and although the 2005 CIUS data are not directly comparable, they also show a significant number of low intensity broadband users. Revisiting the matrix presented earlier (shown below in Table 13, this time incorporating 2005 CIUS data for individuals), it is seen that there is limited room for growth in broadband uptake from low speed high intensity households (and individuals). Interestingly, the data presented here provide some evidence that not having a high speed connection is not a barrier to engagement with the Internet, as the LSHI households showed broader scope of usage than their HSLI counterparts. There is no doubt that broadband

access provides a more convenient and efficient means of engaging with the Internet, and it is expected that the low speed high intensity users will adopt broadband at a later date (likely barriers to broadband adoption in this category are price and availability).

Table 13
Canadian Internet households and individuals, by speed and intensity

	Households	Individuals
	2003	2005 [1]
	percent	
High speed		
High intensity	32.0	37.7
Low intensity	33.7	43.7
Low speed		
High intensity	8.1	5.0
Low intensity	26.2	13.6

1 Canadian Internet Use Survey (CIUS) data cover individuals instead of households and are not strictly comparable with Household Internet Use Survey (HIUS) data from previous years, but are provided here to show overall trends. See Box 2 for further information on data sources.
Source(s): Statistics Canada, Household Internet Use Survey, 2003 and Canadian Internet Use Survey, 2005.

Over time, it is expected that households will migrate into the HSHI quadrant from all other quadrants. In the short term however, it is most likely that the LSLI households will become HSLI households, as is seen in the 2005 CIUS data (which provide an indication of the trend in adoption patterns). Based on the analysis presented here, it is seen that movement within the speed range does not increase engagement as much as movement from low intensity to high intensity.

This study sheds new light on the nature of broadband households in Canada, by showing that not all households are equal. The differences in households' scope of Internet usage do matter, as they reflect differences in readiness for participation in the information society. This study lays the groundwork for additional analysis of Canadian Internet adoption data, showing ways in which measures of scope and intensity create valuable new insights, with important implications for equal access and participation in an information society.

Appendix A — References

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Appendix B — Catalogued publications

Science, Technology and Innovation statistical publications

88-001-X	*Science statistics*
88-003-X	*Innovation analysis bulletin*
88-202-X	*Industrial research and development, intentions (with 2004 preliminary estimates and 2003 actual expenditures) (annual)*
88-204-X	*Federal scientific activities (annual)*
88F0006X	*Science, Innovation and Electronic Information Division working papers*
88F0017M	*Science, Innovation and Electronic Information Division research papers*

88-001-X Volume 32 – 2008

No. 1	Research and Development Personnel (R&D) - 1996 to 2005 (May)
No. 2	Biotechnology Scientific Activities in Federal Government Departments and Agencies, 2006/2007 June)
No. 3	Estimates of Total Spending on Research and Development in the Health Field in Canada, 1996 to 2007(July)
No. 4	Estimation of Research and Development Expenditures in the Higher Education sector, 2006/2007 (August)
No. 5	Industrial Research and Development, 2004 to 2008 (September)

88-001-X Volume 31 – 2007

No. 1	Research and development (R&D) personnel in Canada, 1995 to 2004 (January)
No. 2	Estimates of total spending on research and development (R&D) in the health field in Canada, 1989 to 2006 (March)
No. 3	Biotechnology scientific activities in federal government departments and agencies, 2005/2006 (May)

88-001-X Volume 30 – 2006

No. 1	Distribution of federal expenditures on science and technology, by province and territories, 2003/2004 (February)
No. 2	Biotechnology scientific activities in federal government departments and agencies, 2004/2005 (March)
No. 3	Estimates of total spending on research and development in the health field in Canada, 1988 to 2005 (May)
No. 4	Industrial Research and Development, 2002 to 2006 (August)
No. 5	Estimation of research and development expenditures in the higher education sector, 2004/2005 (August)
No. 6	Federal government expenditures on scientific activities, 2006/2007 (September)
No. 7	Total spending on research and development in Canada, 1990 to 2006, and provinces, 1990 to 2004 (September)
No. 8	Nature of Research and Development, 2000 to 2004 (December)

No. 9 Distribution of federal expenditures on science and technology by province and territories, 2004/2005 (December)

88-001-X Volume 29 – 2005

No. 1 Distribution of federal expenditures on science and technology by province and territories, 2002-2003 (January)
No. 2 Research and development (R&D) personnel in Canada, 1993 to 2002 (May)
No. 3 Biotechnology scientific activities in federal government departments and agencies, 2003-2004 (May)
No. 4 Industrial research and development, 2001 to 2005 (June)
No. 5 Estimates of total spending on research and development in the health field in Canada, 1988 to 2004 (July)
No. 6 Estimation of research and development expenditures in the higher education sector, 2003-04 (December)
No. 7 Federal government expenditures on scientific activities, 2005/2006(December)
No. 8 Total spending on research and development in Canada, 1990 to 2005p, and provinces, 1990 to 2003 (December)

88F0006X Working papers – 2008

No. 1 *Innovative Exporters and Intellectual Property Regimes in Selected Service Industries: Evidence from the Canadian Survey of Innovation 2003 (February)*
No. 2 *The Business of Nurturing Businesses (March)*
No. 3 *Understanding Internet Usage Among Broadband Households: A Study of Household Internet Use Survey Data*

88F0006X Working papers – 2007

No. 1 *Innovativeness and Export Orientation Among Establishments in Knowledge-Intensive Business Services (KIBS), 2003 (April)*
No. 2 *Where Are the Scientists and Engineers? (April)*
No. 3 *Results from the Functional Foods and Nutraceuticals Survey - 2005 (May)*

88F0006X Working papers – 2006

No. 1 *Provincial distribution of federal expenditures and personnel on science and technology, 1997/1998 to 2003/2004 (April)*
No. 2 *Buying and selling research and development services, 1997 to 2002 (May)*
No. 3 *Characteristics of Growth Firms, 2004/2005 (May)*
No. 4 *Scientific and Technological Activities of Provincial Governments and Provincial Research Organizations, 2000/2001 to 2004/2005 (July)*
No. 5 *Research and Development in the Field of Advanced Materials, 2001 to 2003 (July)*
No. 6 *Conceptualizing and Measuring Business Incubation (July)*
No. 7 *Characteristics of Business Incubation in Canada, 2005 (July)*
No. 8 *Size and Persistence of R&D Performance in Canadian Firms, 1994 to 2002 (August)*
No. 9 *Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1995 to 2006, and by Province 1995 to 2004 (September)*
No. 10 *Are Small Businesses Positioning Themselves for Growth? A Comparative Look at the Use of Selected Management Practices by Firm Size (October)*
No. 11 *Survey of Intellectual Property Commercialization in the Higher Education Sector, 2004 (October)*

No. 12 *Provincial Distribution of Federal Expenditures and Personnel on Science and Technology (December)*

88F0006X Working papers – 2005

No. 1 *Federal government expenditures and personnel in the natural and social sciences, 1995/96 to 2004/05 (January)*
No. 2 *Provincial distribution of federal expenditures and personnel on science and technology, 1996-97 to 2002-03 (January)*
No. 3 *Industrial R&D statistics by region, 1994 to 2002 (January)*
No. 4 *Knowledge sharing succeeds: how selected service industries rated the importance of using knowledge management practices to their success (February)*
No. 5 *Characteristics of firms that grow from small to medium size: Industrial and geographic distribution of small high-growth firms (February)*
No. 6 *Summary: Joint Statistics Canada – University of Windsor workshop on intellectual property commercialization indicators, Windsor, November 2004 (March)*
No. 7 *Summary: Meeting on commercialization measurement, indicators, gaps and frameworks, Ottawa, December 2004 (March)*
No. 8 *Estimates of research and development personnel in Canada, 1979 to 2002 (May)*
No. 9 *Overview of the biotechnology use and development survey – 2003 (April)*
No. 10 *Access to financing capital by Canadian innovative biotechnology firms (April)*
No. 11 *Scientific and technological activities of provincial governments and provincial research organizations, 1995-96 to 2003-04 (September)*
No. 12 *Innovation in Information and Communication Technology (ICT) sector service industries: Results from the Survey of Innovation 2003 (October)*
No. 13 *Innovation in selected professional, scientific and technical services: Results from the Survey of Innovation 2003 (October)*
No. 14 *Innovation in selected transportation industries: Results from the Survey of Innovation 2003 (November)*
No. 15 *Innovation in selected industries serving the mining and forestry sectors: Results from the Survey of Innovation 2003 (November)*
No. 16 *Functional foods and nutraceuticals: The development of value-added food by Canadian firms (September)*
No. 17 *Industrial R&D statistics by region 1994 to 2003 (November)*
No. 18 *Survey of intellectual property commercialization in the higher education sector, 2003 (November)*
No. 19 *Estimation of research and development expenditures in the higher education sector, 2003-2004 (December)*
No. 20 *Estimates of Canadian research and development expenditures (GERD), Canada, 1994 to 2005, and by province 1994 to 2003 (December)*